10/23/05 5:51:11 PM

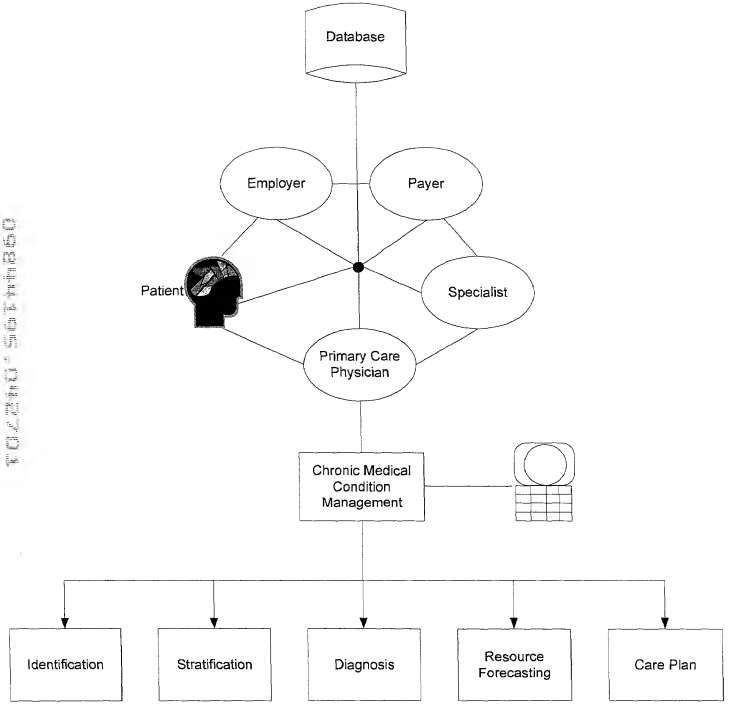

FIG. 1

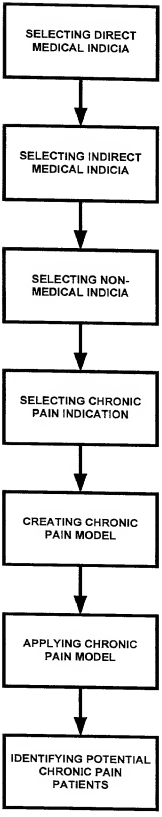
SELECTING DIRECT MEDICAL INDICIA
SELECTING INDIRECT MEDICAL INDICIA
SELECTING NON-MEDICAL INDICIA
SELECTING CHRONIC PAIN INDICATION
CREATING CHRONIC PAIN MODEL
APPLYING CHRONIC PAIN MODEL
IDENTIFYING POTENTIAL CHRONIC PAIN PATIENTS

FIG. 2

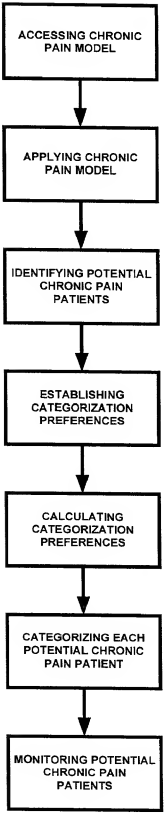
ACCESSING CHRONIC PAIN MODEL
APPLYING CHRONIC PAIN MODEL
IDENTIFYING POTENTIAL CHRONIC PAIN PATIENTS
ESTABLISHING CATEGORIZATION PREFERENCES
CALCULATING CATEGORIZATION PREFERENCES
CATEGORIZING EACH POTENTIAL CHRONIC PAIN PATIENT
MONITORING POTENTIAL CHRONIC PAIN PATIENTS

FIG. 3

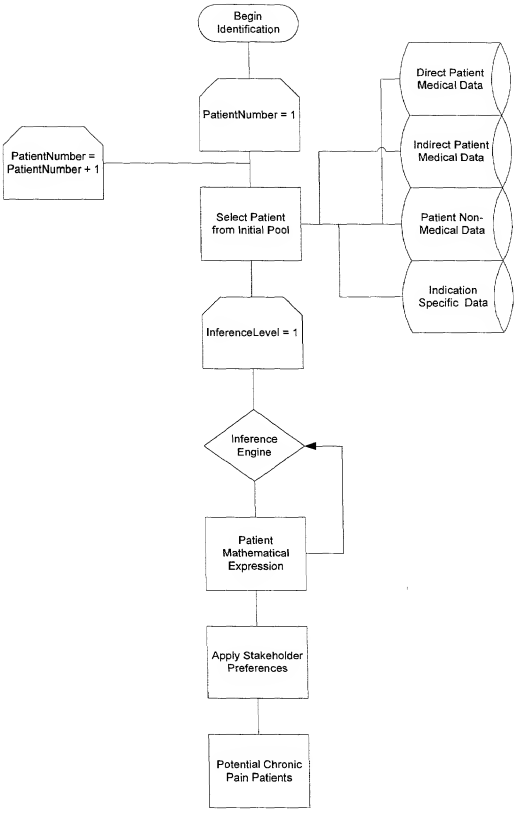
Begin Identification
PatientNumber = 1
PatientNumber = PatientNumber + 1
Select Patient from Initial Pool
Direct Patient Medical Data
Indirect Patient Medical Data
Patient Non-Medical Data
Indication Specific Data
InferenceLevel = 1
Inference Engine
Patient Mathematical Expression
Apply Stakeholder Preferences
Potential Chronic Pain Patients

FIG. 4

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Direct Medical Indicia	Positive In	Possible Out	Probable In	Possible In
1. ICD-9-CM "Specific" Lumbar Spine Diagnoses Code			X	
2. ICD-9-CM "Non-specific" Generalized Pain Syndrome Diagnoses Codes			X	
3. ICD-9-CM Diagnosis Code Identifying a Co-morbidity Commonly Associated with Lumbar Spine Injury				X
4. ICD-9-CM "Other" Medical Condition Diagnostic Code Clearly Attributing the Condition to a Non-Lumbar Spine Diagnosis		X		
5. ICD-9-CM Procedure Codes Indicating the Condition is Related to a Known Acute Condition (e.g. post-operative surgical pain)		X		
6. CPT Codes Indicating the Condition is Related to a Known Acute Condition (e.g. post-operative surgical pain)		X		
7. ICD-9-CM Procedure Codes Relating to Lumbar Spine Care				X
8. ICD-9-CM Procedure Codes Relating to Lumbar Spine Pain				X
9. ICD-9-CM Procedure Codes Relating to Lumbar Spine Pain Establishing a Pattern of Chronicity (time and homogeneity)	X			
10. CPT Codes Identifying Lumbar Spine Care-related Procedures				X
11. CPT Codes Identifying Lumbar Spine Pain-related Procedures			X	
12. CPT Codes Identifying Lumbar Spine Pain-related Procedures Establishing a Pattern of Chronicity				
13. Drug Prescription Codes for opioid, non-steriodal or muscle relaxant indicating dosage, frequency, length of time, combinations consistent with spine pain treatment				X
14. Drug Prescription Codes for opioid, non-steriodal or muscle relaxant indicating dosage, frequency, length of time, combinations identifying patient as being at risk of developing a chronic lumbar pain condition				X
15. Drug Prescription Codes for opioid, non-steriodal or muscle relaxant indicating dosage, frequency, length of time, combinations consistent with chronic spine pain treatment	X			

FIG. 5a

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Direct Medical Indicia	Positive In	Possible Out	Probable In	Possible In
16. Emergency Room Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Condition				X
17. Emergency Room Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Pain Condition			X	
18. Emergency Room Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Establishing the Chronicity of a Lumbar Spine Pain Condition (time and pattern or homogeneity)	X			
19. Hospitalizations Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Condition				X
20. Hospitalizations Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Pain Condition			X	
21. Hospitalizations Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Establishing the Chronicity of Lumbar Spine Pain Condition (time and pattern or homogeneity)	X			
22. Physician Office Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Condition				
23. Physician Office Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Indicating a Lumbar Spine Pain Condition				X
24. Physician Office Visits (with ICD-9-CM, CPT or Drug Codes, or test results) Establishing the Chronicity of a Lumbar Spine Pain Condition (time and pattern or homogeneity of complaint)	X			
25. Rehabilitation or Palliative Care ICD-9-CM Procedure Codes				X
26. Telephone Consultation (with documentation relating to lumbar spine pain condition)				X
27. Coded Trauma (related test result, procedure, etc.)				X

FIG. 5b

Direct Medical Indicia Drug Product	Maximum Adult Recommended Daily Dose	Positive In (120 day timeframe)	Probable In (120 day timeframe)	Possible In (120 day timeframe)
Over The Counter Non-Narcotic Analgesic Agents				
Acetaminophen (Tylenol)	12 tabs	12 tabs ≥91 days	<12 tabs ≥91 days	<12 tabs <91 days
Aspirin 325mg	18 tabs	18 tabs ≥91 days	<18 tabs ≥91 days	<18 tabs <91 days
Ibuprofen 200mg (Motrin)	16 tabs	16 tabs ≥91 days	<16 tabs ≥91 days	<16 tabs <91 days
Salicylate Agents				
Salsalate 500mg (Disalcid)	6 tabs	6 tabs ≥91 days	<6 tabs ≥91 days	<6 tabs <91 days
Diflunisal 500mg (Dolobid)	3 tabs	3 tabs ≥91 days	<3 tabs ≥91 days	<3 tabs <91 days
Opioid and Related Analgesic Agents				
APAP/Propoxyphene Napsylate 100 (Darvocet-N 100)	6 tabs	6 tabs ≥91 days	<6 tabs ≥91 days	<6 tabs <9 days
APAP/Oxycodone 5/325 (Percocet)	12 tabs	12 tabs ≥91 days	<12 tabs ≥91 days	<12 tabs <91 days
ASA/Oxycodone 5/325 (Percodan)	18 tabs	18 tabs ≥91 days	<18 tabs ≥91 days	<18 tabs <91 days
APAP/Oxycodone 5/500 (Tylox)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days
APAP/Hydrocodone 5/500 (Vicodin)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days
APAP/Hydrocodone 10/650 (Lorcet)	6 tabs	6 tabs ≥91 days	<6 tabs ≥91 days	<6 tabs <91 days
APAP/Hydrocodone 2.5/500 (Lortab)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days

FIG. 6a

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Direct Medical Indicia Drug Product	Maximum Adult Recommended Daily Dose	Positive In (120 day timeframe)	Probable In (120 day timeframe)	Possible In (120 day timeframe)
APAP/Codeine 30/300 (Tylenol-3)	12 tabs	12 tabs ≥91 days	<12 tabs ≥91 days	<12 tabs <91 days
Non-Steroidal Anti-inflammatory Drugs (NSAIDs)				
Celecoxib (Celebrex)	4 caps	4 caps ≥91 days	<4 caps ≥91 days	<4 caps <91 days
Diclofenac 100mg ER (Voltaren XR)	2 tabs	2 tabs ≥91 days	<2 tabs ≥91 days	<2 tabs <91 days
Etodolac Extended Release 400mg (Lodine XL)	3 tabs	3 tabs ≥91 days	<3 tabs ≥91 days	<3 tabs <91 days
Naproxen Controlled Release 500mg (Naprelan)	2 tabs	2 tabs ≥91 days	<2 tabs ≥91 days	<2 tabs <91 days
Nabumeton 500mg (Relafen)	4 tabs	4 tabs ≥91 days	<4 tabs ≥91 days	<4 tabs <91 days
Muscle Relaxants				
Carisoprodol (Soma)	4 tabs	4 tabs ≥91 days	<4 tabs ≥91 days	<4 tabs <91 days
Chlorzoxazone (Paraflex)	12 tabs	12 tabs ≥91 days	<12 tabs ≥91 days	<12 tabs <91 days
Cylobenzaprine (Flexeril)	6 tabs	6 tabs ≥91 days	<6 tabs ≥91 days	<6 tabs <91 days
Diazepam 5mg (Valium)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days
Metaxalone (Skelaxin)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days
Methocarbamol 500 (Robaxin)	8 tabs	8 tabs ≥91 days	<8 tabs ≥91 days	<8 tabs <91 days
Orphenadrine Citrate (Norflex)	2 tabs	2 tabs ≥91 days	<2 tabs ≥91 days	<2 tabs <91 days

FIG. 6b

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Indirect Medical Indicia	Measure	Remarks
1. Physician Office Visits a. Documented reason for visit b. Physician specialty associated with visit c. Time period establishing chronicity	a. Associated ICD-9-CM or CPT code. b. Medical record notation. c. Associated time period, either multiple visits within an associated period of time; or pattern of visits showing elapsed period of time (e.g. $\geq$91 days).	Chronic pain patients frequently visit the physician office, for pain related reasons as well as for complaints of non-specific origin.
2. Emergency Room Visits a. Reason for visit b. Time period establishing chronicity	a. Associated ICD-9-CM or CPT code. b. Associated time period, either multiple visits within an associated period of time; or pattern of visits showing elapsed period of time (e.g. $\geq$91 days months).	Chronic pain patients frequently present to the ER for pain related reasons as well as for complaints non-specific in origin.
3. Drug Therapy a. Drug prescription b. Drug combinations c. Dosing levels d. Prescription patterns e. Time period establishing chronicity f. Pattern of substance abuse	a. Drug code for drugs (e.g. anti-inflammatory, anti-depressant, muscle relaxant, opioid) associated with pain symptom treatment. b. Drug codes, when used in combination, tend to indicate presence of pain. c. Dosing level consistently high. d. Multiple prescribers. e. Associated time period establishing elapsed period of time ($\geq$91 days). f. Evidence of drug over use or use of illegal drugs.	Prescription and non-prescription drug use is a common indicator of chronic pain. Such drugs are often provided to patients from a variety of sources in an uncoordinated manner, or without the development of a patient plan of care.
4. Telephone Consults a. Documented reason for call b. Frequency of calls c. Pattern of calls d. Time period establishing chronicity	a. Notation in medical record, associated code if possible. b. Calls outside the defined range of frequency for a typical patient. c. Clustered calls with a defined time period. e. Associated time period establishing elapsed period of time ($\geq$91 days).	Chronic pain patients often demand more attention from their caregivers than the general population, for symptom –specific as well as for non-symptom specific reasons.

FIG. 7a

Indirect Medical Indicia	Measure	Remarks
5. Primary Diagnosis	ICD-9-CM diagnostic code associated with pain condition or trauma, or with a disease known to have associated pain condition.	Chronic pain can be identified through diagnostic codes two ways: the pain can be a condition associated with a disease state such as diabetes (indirect), or it can be the primary reason for the pain condition such as low back pain (direct).
6. Co-Morbidities	ICD-9-CM diagnostic code associated with conditions known to occur with chronic pain.	Certain co-morbidities are known to be associated with chronic pain.
7. Hospitalizations a. Time period establishing chronicity b. Admitting diagnosis c. Procedures performed	a. Associated time period either multiple visits within an associated period of time, or pattern of visits showing elapsed period of time (e.g. ≥91 days). b. Associated ICD-9-CM diagnostic code. c. Pattern of ICD-9-CM and CPT procedure codes.	Certain chronic pain patients are frequently hospitalized, either to treat spikes in pain, or to receive back-related procedures.
8. Evidence of trauma a. Diagnostic test associated with trauma	a. Test results such as x-ray, contained in medical record.	Numerous chronic pain indications are trauma-related in origin (e.g. CRPS).
9. Evidence of palliative or rehabilitation care a. Documented procedure b. Pattern of care c. Time interval establishing chronicity	a. ICD-9-CM procedure codes associated with palliative or rehabilitation care. b. Evidence of care seeking behavior relating to combination of providers. c. Associated time period, either multiple visits within an associated period of time; or pattern of visits showing elapsed period of time (e.g. ≥91 days).	Chronic pain patients receive a variety of physical therapy, chiropractic services, acupuncture therapy and other similar types of services to treat their condition.

FIG. 7b

Non-Medical Indicia	Positive In	Positive Out	Probable In	Possible In
1. Patient Self-Assessment - Pain Significantly Interferes with Life Activities	X			
2. Patient Self-Assessment - High Pain Intensity Rating	X			
3. Patient Self-Assessment - Intense and Multiple Pain Descriptors	X			
4. Patient Self-Assessment - High Impact of Pain on Mood	X			
5. Patient Self-Assessment - Low Family Support			X	
6. Patient Self-Assessment - High Impact of Pain on Ability to Work	X			
7. Patient Self-Assessment - High Impact of Pain on Health Status	X			
8. Patient Self-Assessment - Downward Health Trend			X	
9. Patient Self Assessment - Depression			X	
10. Patient Self-Assessment - Low Life Satisfaction Score			X	
11. Patient Self-Assessment - Low Job Satisfaction Score			X	X
12. Patient Self-Assessment, or Family Assessment - Poor Community Support Structure			X	X
13. Patient Self-Assessment, or Family Assessment - Lack of Daytime Distractions			X	X
14. Patient is a Smoker			X	
15. Other Behavior Characteristics • Current • Past*				X
16. Patient Matches Personality/Psychological Risk Profile			X	
17. Pending Litigation Relating to Injury				X
18. Patient is Overweight by more than 25% of Normal Weight			X	
19. Patient's Job is in a High Work Risk Category				X
20. Patient Involved in Recent or Pending Divorce				X

FIG. 8a

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Non-Medical Indicia	Positive In	Positive Out	Probable In	Possible In
21. Other Demographic Indicators: • Age • Gender • Economic status • Race/ethnicity*				X
22. Presence of an open workers' compensation claim				X
23. Patient has Hired an Attorney for Representation on a Work-related Injury				X

FIG. 8b

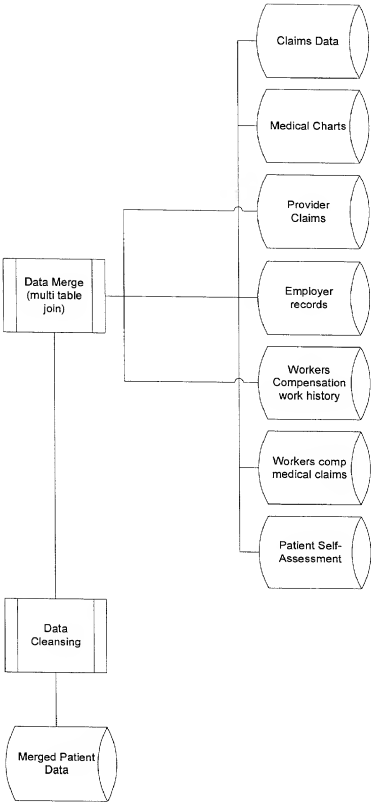
Claims Data
Medical Charts
Provider Claims
Employer records
Workers Compensation work history
Workers comp medical claims
Patient Self-Assessment
Data Merge (multi table join)
Data Cleansing
Merged Patient Data

FIG. 9

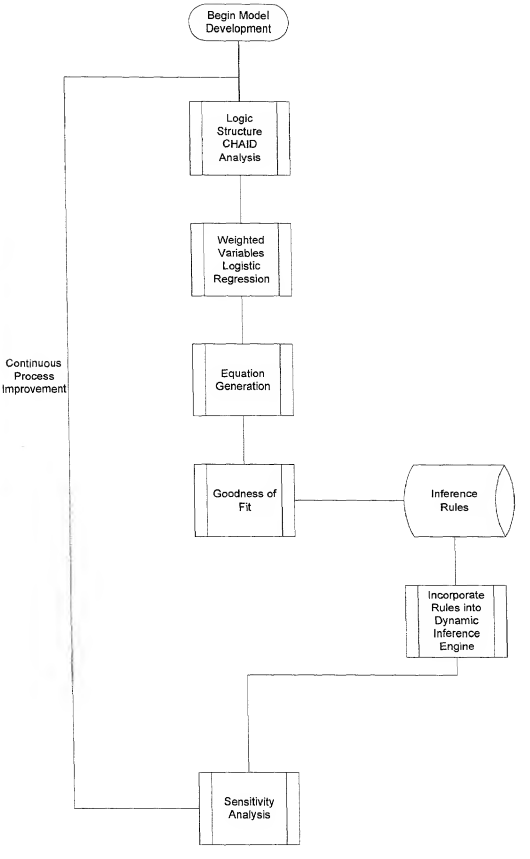
Begin Model Development
Logic Structure CHAID Analysis
Weighted Variables Logistic Regression
Equation Generation
Goodness of Fit
Inference Rules
Incorporate Rules into Dynamic Inference Engine
Sensitivity Analysis
Continuous Process Improvement

FIG. 10

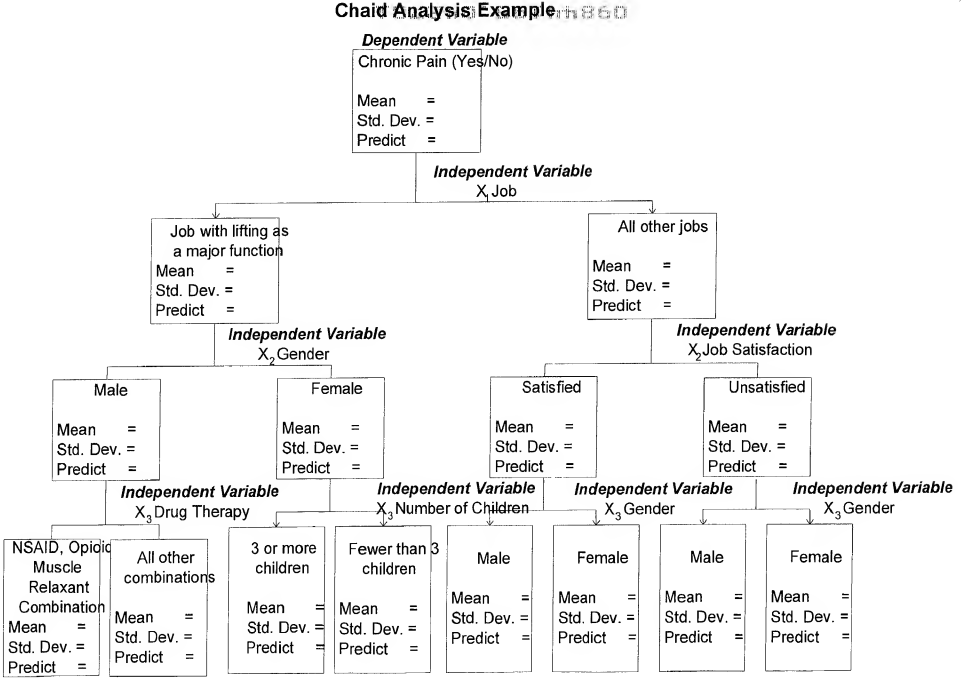
Chaid Analysis Example
Dependent Variable
Chronic Pain (Yes/No)
Mean =
Std. Dev. =
Predict =
Independent Variable
X1 Job
Job with lifting as a major function
Mean =
Std. Dev. =
Predict =
All other jobs
Mean =
Std. Dev. =
Predict =
Independent Variable
X2 Gender
Independent Variable
X2 Job Satisfaction
Male
Mean =
Std. Dev. =
Predict =
Female
Mean =
Std. Dev. =
Predict =
Satisfied
Mean =
Std. Dev. =
Predict =
Unsatisfied
Mean =
Std. Dev. =
Predict =
Independent Variable
X3 Drug Therapy
Independent Variable
X3 Number of Children
Independent Variable
X3 Gender
Independent Variable
X3 Gender
NSAID, Opioid Muscle Relaxant Combination
Mean =
Std. Dev. =
Predict =
All other combinations
Mean =
Std. Dev. =
Predict =
3 or more children
Mean =
Std. Dev. =
Predict =
Fewer than 3 children
Mean =
Std. Dev. =
Predict =
Male
Mean =
Std. Dev. =
Predict =
Female
Mean =
Std. Dev. =
Predict =
Male
Mean =
Std. Dev. =
Predict =
Female
Mean =
Std. Dev. =
Predict =

FIG. 11

Chronic Pain Patient Identificatiom Process: Example of Flow Per Indication

PLACENT SCANNED

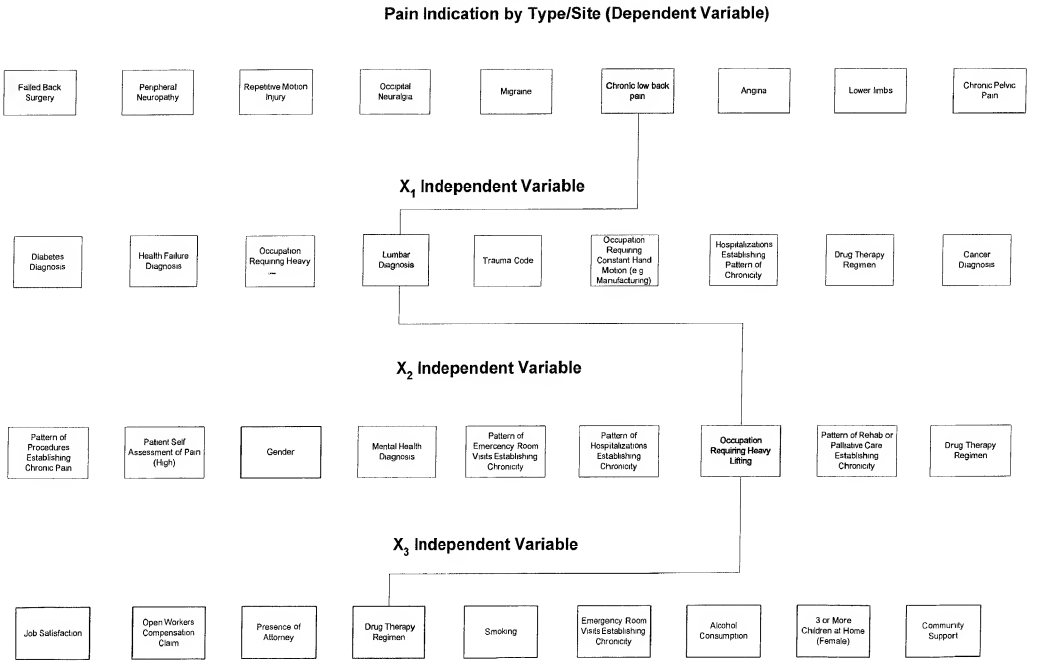

FIG. 12

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Logistics Output Independent Variable	Variable Parameter	Odds Ratio	P-Value
Constant	(+)		
Occupation Based upon Lifting (X_1)	(+)	3.1	P<0.05
Gender (Male) (X_2)	(+)	2.1	P<0.05
Drug Therapy (X_3)	(+)	1.9	P<0.05
(X_4)			
(X_5)			

FIG. 13

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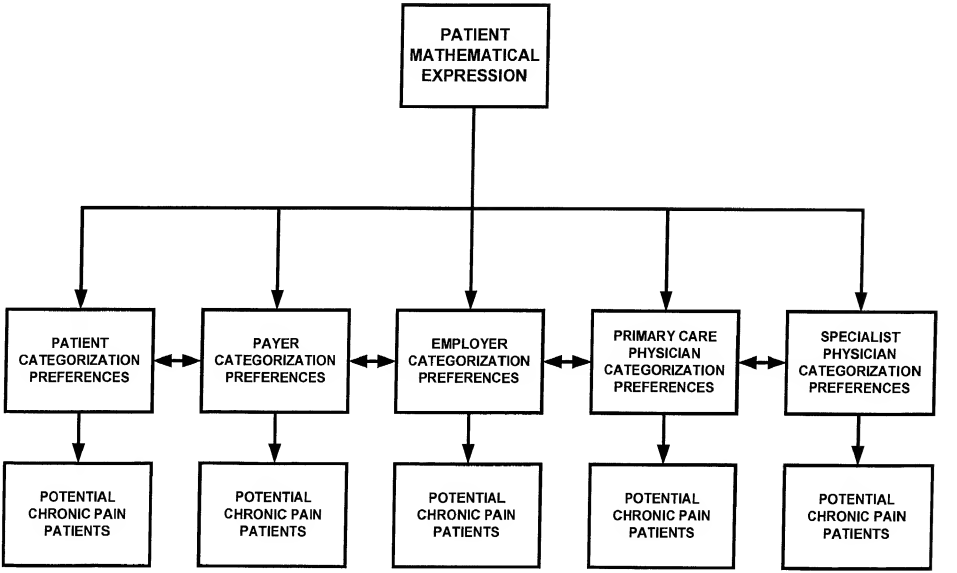

FIG. 14

Provided by eDAPS

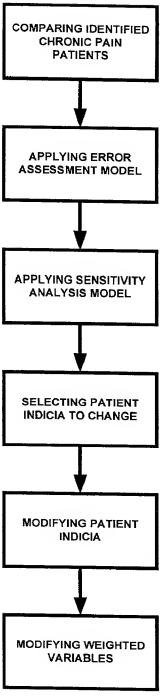

FIG. 15

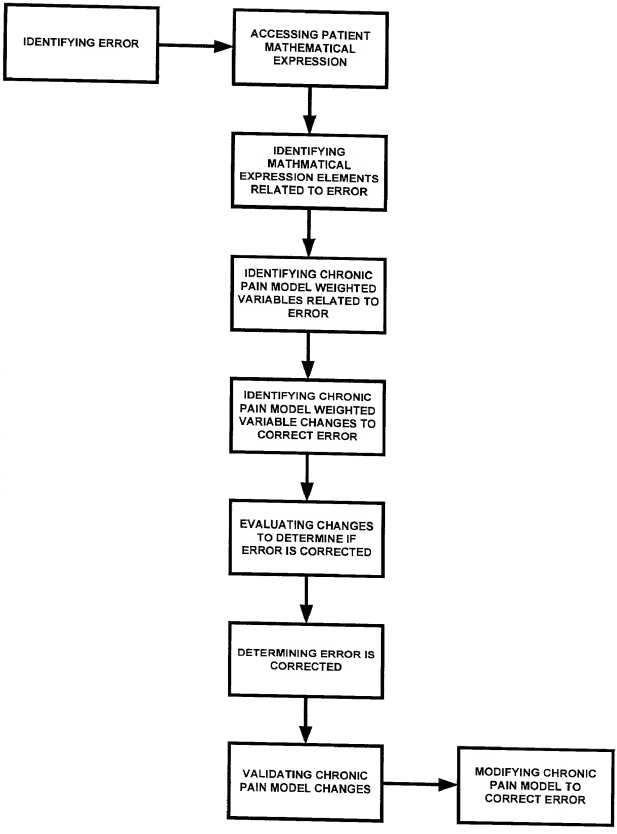
IDENTIFYING ERROR
ACCESSING PATIENT MATHEMATICAL EXPRESSION
IDENTIFYING MATHMATICAL EXPRESSION ELEMENTS RELATED TO ERROR
IDENTIFYING CHRONIC PAIN MODEL WEIGHTED VARIABLES RELATED TO ERROR
IDENTIFYING CHRONIC PAIN MODEL WEIGHTED VARIABLE CHANGES TO CORRECT ERROR
EVALUATING CHANGES TO DETERMINE IF ERROR IS CORRECTED
DETERMINING ERROR IS CORRECTED
VALIDATING CHRONIC PAIN MODEL CHANGES
MODIFYING CHRONIC PAIN MODEL TO CORRECT ERROR

FIG. 16